REMARKS

The Office Action dated April 11, 2003 has been carefully considered. Claims 1, 3, 5, 6, 7, 14 and 16 have been amended. Claims 1-18 are in this application.

This amendment is submitted to supplement to response forwarded July 11, 2003. In particular, claims 5, 6 and 7 have been amended to represent that the absolute value of the temperature difference is claimed. Support for this amendment is found through the specification and in particular on page 9, lines 30-31. No new matter has been added.

The specification has been amended to correct minor errors, as requested by the Examiner.

Claims 1-18 were rejected under 35 U.S.C. § 112 as indefinite. Applicants have amended claims 1, 3, 5, 6, 7, 14 and 16 to obviate the Examiner's rejection. In particular, Applicants have amended claim 1 to positively recite a distillation step. Applicants have amended claims 3, 5, 6, 7 and 14 to provide antecedent basis for the "distillation column." Claim 14 has been amended to recite two separate streams, as suggested by the Examiner. Claim 16 has been amended to provide antecedent basis for the raw material liquid. No new matter has been entered.

The previously-presented claims 1-18 were rejected under 35 U.S.C. § 103 as obvious in view of Applicants' disclosure of admitted prior art, U.S. Patent No. 5,315,037 to Sakamoto et al. or U.S. Patent No. 4,987,252 to Kuragano et al. in combination with U.S. Patent No. 5,132,918 to Funk or Japan 56-122327 ("JP '327").

Sakamoto et al. describe a process for purification of acrylic acid comprising the steps of providing a mixed gas of acrylic acid and by-products produced by catalytic gas phase oxidation of propylene and/or acrolein, contacting the mixed gas with water to obtain an aqueous solution, and adding an azeotrope solvent to the aqueous solution for distillation to obtain a mixture of the by-products, water and the azeotrope solvent from a tower top and acrylic acid from a tower bottom. Highly pure acrylic acid is obtained by using, as the azeotrope solvent, a mixed solvent of solvent A selected from diethyl ketone, methyl propyl ketone, methyl isobutyl ketone, methyl-tert-butyl ketone, n-propyl acetate and mixtures thereof and solvent B selected from toluene, heptane, methyl cyclohexane and mixtures thereof.

In contrast to the invention defined by the present claims, Sakamoto et al. do not teach or suggest, as noted by the Examiner, feeding to a distillation column the raw material liquid which temperature is substantially equal to that of an entrance place in the column. Rather, Sakamoto et al. teach the use of an azeotrope solvent in the process for producing acrylic acid. In contrast, the present invention is substantially free from azeotropic solvent. Thus, Sakamoto et al. do not teach or suggest the advantages of the present invention that polymerization can be prevented by adjusting the temperature of the raw material.

In accordance with the present Example 1 and Comparative Example 6, which corresponds to Sakamoto et al. wherein the azeotropic solvent is used, Comparative Example 6 indicates "there occurred pressure losses in the column on the 21st day after the start of the operation, and then the operation became difficult to continue", adversely continuous operation was steadily performed for 30 days in Example 1. Accordingly, the difference of the feed led the different result even if other operation conditions were the same.

Kuragano et al. relates to recovering methacrolein and/or methacrylic acid by quenching a reaction product gas obtained by catalytic oxidation of isobutylene.

In contrast to the invention defined by the present claims, Kuragano et al. do not teach or suggest distilling raw material liquid in a distillation column. Rather, Kuragano et al. is related to a quenching method. Further, Kuragano et al. do not teach or suggest feeding to a distillation column the raw material liquid which temperature is substantially equal to that of an entrance place in the column.

Funk describes a method for automated control of a petroleum distillation column in which signals representing temperatures, pressures and fluid rates for selected product streams withdrawn from the column are transmitted to a digital computer. Further, Funk, as shown in Fig. 1, teaches sensing the temperature of the feed at the column inlet (which is substantially the same as the temperature of the feed at the furnace exit) by means of element 92 and converting the same into an electrical signal 94 representative of such temperature for input as a signal to process control computer 96 (col. 5, line 65 - col. 6, line 2). In addition, Funk measures the temperatures of the point inside the column by means of elements 110 and 116 in Fig. 1 which

positions are different from the entrance place of the feed in the distillation column of the present claimed invention.

In contrast to the invention defined by the present claims, Funk does not teach or suggest feeding to a distillation column the raw material liquid which temperature is substantially equal to that of an entrance place in the column. Rather, Funk teaches sensing a temperature of the feed at the furnace entrance and a point inside the column which positions are different than the entrance place of the feed in the distillation column. Thus, Funk does not teach or suggest the prevention of polymerization by adjusting the temperature of the raw material liquid to be fed to the temperature of the entrance place of the raw material liquid in the distillation column, as described in the invention defined by the present claims.

JP '327 teaches recovering heat from a reaction gas containing meth(acrylic) acid formed through the vapor phase oxidation reaction and keeping the reaction gas temperature at the scrubber inlet at above 140° C but not higher than the reaction temperature. A polymerization inhibitor such as hydroquinone may be added to the collected (meth)acrylic acid to prevent polymerization thereof.

In contrast to the invention defined by the present claims, JP '327 does not teach or suggest feeding to a distillation column the raw material liquid which temperature is substantially equal to that of an entrance place in the column. Instead, JP '327 discloses keeping the reaction gas temperature at the scrubber inlet at a temperature of greater than 140° C. There is no teaching or suggestion in JP '327 that polymerization can be prevented by adjusting the temperature of the raw material. Rather, JP '327 teaches using a polymerization inhibitor for preventing polymerization.

Accordingly, Funk and JP '327 do not cure the deficiencies of Sakamoto et al. or Kuragano et al, noted above. Further, none of the cited references, Sakamoto et al. or Kuragano et al. in combination with Funk and JP '327, teach or suggest the invention defined by the present claims since none of the references teach feeding to a distillation column a raw material liquid which temperature is substantially equal to that of an entrance place in the distillation column.

In view of the foregoing, Applicants submit that all pending claims are in condition for allowance and request that all claims be allowed. The Examiner is invited to contact the undersigned should he believe that this would expedite prosecution of this application. It is believed that no fee is required. The Commissioner is authorized to charge any deficiency or credit any overpayment to Deposit Account No. 13-2165.

Respectfully submitted,

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Diane Dunn McKay
Reg. No. 34,586
Attorney for Applicant

MATHEWS, COLLINS, SHEPHERD & McKAY, P.A.
100 Thanet Circle, Suite 306
Princeton, NJ 08540
Tel: 609 924 8555
Fax: 609 924 3036